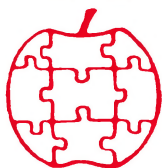


Apple

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Assembly

Line

Volume 6 -- Issue 12

September, 1986

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What About the New Apple //?

The cloud of rumors surrounding a new, improved, much more powerful Apple // machine is beginning to condense, but there is still no solid public information and no data coming out of Apple. The latest hints indicate that there will be a major announcement sometime this month, so we might all know the answers by the time you read these words.

There is one thing you can be certain of: As soon as we can come out with reliable and accurate details, Apple Assembly Line will be the place to read about how to explore and program this new successor to the computer that all of us have devoted so much to and gotten so much from.

Many of the people we talk to are anticipating an explosion of excitement much like the "good old days" of the original Apple II. They expect the unveiling of such accessible power to rekindle the spirit that drew many of us into computing in the first place: a new world to explore. We hope that's true, and we're going to do our part to help it happen.

A Short Symbol Table Listing for the
ProDOS S-C Macro Assembler.....Harvey R. Brown

The symbol table printed by the S-C Macro Assembler for a long program can be 20 or 30 pages long. Since the assembler allows for labels up to 32 characters long, and values up to 8 hexadecimal digits long, it only prints one label and value per line. Local labels are printed seven to a line, but I am not usually interested in their values anyway. Many times I would like a nice compact listing of only the named labels.

I personally try to stick to relatively short label names, so there would normally be room for four columns of labels in a compact listing. If we say the line length is up to 79 characters (calling it 80 might produce double spacing), that leaves 18 characters per column. I hardly ever have any values which require more than four digits to print in hexadecimal. Allowing for at least one blank between columns, and for a dash between label name and value, that means I have room for names of up to 12 characters long.

I wrote a USR command for the ProDOS version of the S-C Macro Assembler. After it is installed, typing USR causes the named labels to be listed in four columns in alphabetical order. Typing USR2 causes them to be listed in the order of their definition, which for the sake of this discussion I am calling "numerical" order.

I analyzed several symbol tables in memory after different assemblies, and figured out most of the data. The symbol table begins at \$1000, with the symbols in the order of their definition in the source code. Each entry has a 2-byte pointer to the next entry beginning with the same letter in alphabetical order. Next is a 4-byte value, with the low byte first. Next is a key byte, which contains a flag bit for whether or not there are local labels under this label, and the length of the label name. Following the key byte there are from 1 to 32 ASCII characters for the label name. If there are any local labels, there are up to 100 pairs of bytes following the label name, terminated by a single \$00 byte. The first byte of each pair is the label number in binary + \$80. Since local labels are numbered from .0 to .99, the first byte of each pair can have \$80 through \$E3 in it. The second byte of each pair can have any value from \$00 through \$FF in it, and is the offset from the named label value.

The pointers at the beginning of each entry are chained alphabetically. There is a separate chain for each starting letter, A through Z. A table beginning at \$0132 holds the address of the first symbol for each letter of the alphabet. This makes it easy for my program to list the symbols in alphabetical order, without doing any sorting.

There are two main routines, SYM1 and SYM2, to handle the alphabetic and numeric order. DO.ITEM outputs the name and address for a symbol. NEXT.ITEM.A moves a pointer to the next entry in alphabetical order, while NEXT.ITEM.N does the same in "numerical" order.

S-C Macro Assembler Version 2.0.....DOS \$100, ProDOS \$100, both for \$120
 Version 2.0 DOS Upgrade Kit for 1.0/1.1/1.2 owners.....\$20
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 Applesoft Toolbox Series (Roger Wagner Publishing).....each (\$39.95) \$36 *
 all four (\$159.80) \$140 *
 MacASM -- Macro Assembler for Macintosh (Mainstay).....(\$150.00) \$100 *
 S-C Documentor (complete commented source code of Applesoft ROMs).....\$50
 Cross Assemblers for owners of S-C Macro Assembler....\$32.50 to \$50 each
 (Available: 6800/1/2, 6301, 6805, 6809, 68000, Z-80, Z-8, 8048,
 8051, 8085, 1802/4/5, PDP-11, G1650/70, others)

AAL Quarterly Disks.....each \$15, or any four for \$45
 Each disk contains the source code from three issues of AAL:
 Jan-Mar, Apr-Jun, Jul-Sep, and Oct-Dec.
 (All source code is formatted for S-C Macro Assembler. Other assemblers
 require some effort to convert file type and edit directives.)

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 Minuteman 250 Uninterruptible Power Supply.....(\$359) \$350 +

"65816/65802 Assembly Language Programming", Fischer.....(\$19.95) \$18 *
 "Programming the 65816", Eyes.....(\$22.95) \$21 *
 "Apple //e Reference Manual", Apple Computer.....(\$24.95) \$23 *
 "Apple //c Reference Manual", Apple Computer.....(\$24.95) \$23 *
 "ProDOS Technical Reference Manual", Apple Computer.....(\$29.95) \$27 *
 "Now That You Know Apple Assembly Language...", Gilder.....(\$19.95) \$18 *
 "Apple ProDOS: Advanced Features for Programmers", Little..(\$17.95) \$17 *
 "Inside the Apple //c", Little.....(\$19.95) \$18 *
 "Inside the Apple //e", Little.....(\$19.95) \$18 *
 "Apple II+/IIf Troubleshooting & Repair Guide", Brenner....(\$19.95) \$18 *
 "Apple II Circuit Description", Gayler.....(\$22.95) \$21 *
 "Understanding the Apple II", Sather.....(\$22.95) \$21 *
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I chose \$7400 as the origin. The area from \$7400 through \$77FF is only used by the EXEC command in the ProDOS S-C Macro Assembler. When you assemble the program, the object code will be automatically written on the binary file B.SHORTSYM (because of the .TF directive in line 1030). Thereafter, you can install the USR and USR2 commands by typing "-B.SHORTSYM". It will remain installed until you use the EXEC command or leave the assembler system.

[It turns out to be quite easy to adapt Harvey's fine program for the DOS version of the assembler. You just need to make the following changes or additions:

```

1020                .OR $800      or whatever
1200 LOMEM          .EQ $4A,4B
1220 USR.VECTOR     .EQ $D006

1381                LDA $C083
1382                LDA $C083
1421                LDA $C080

```

And that's all there is to it! Thanks, Harvey. Bill M.]

```

7400- 1000 *SAVE S.SHORTSYM
      1010 *-----
      1020                .OR $7400
      1030                .TF B.SHORTSYM
      1040 *-----
      1050 * SHORTSYM by Harvey R. Brown
      1060 *      August 3, 1986
      1070 *-----
04-   1080 NO.COLUMNS .EQ 4
4F-   1090 LINE.LENGTH .EQ 79
      1100 *-----
00-   1110 PTR          .EQ 0,1
02-   1120 ALPH.INDEX .EQ 2
03-   1130 NONZERO     .EQ 3
04-   1140 HORIZ       .EQ 4
05-   1150 KEY         .EQ 5
06-   1160 LENGTH      .EQ 6
07-   1170 YSAVE       .EQ 7
      1180 *-----
CC-   1190 END.TABLE   .EQ $CC,CD
67-   1200 LOMEM       .EQ $67,68  WARNING: PRODOS VERSION ONLY
      1210
8006- 1220 USR.VECTOR .EQ $8006  WARNING: PRODOS VERSION ONLY
      1230 *-----
0200- 1240 IN          .EQ $200
0132- 1250 ALPHTABLE .EQ $132  ADDRESSES FOR 1ST ENTRY A,B,..
      1260 *-----
C000- 1270 KEYBD      .EQ $C000
C010- 1280 STROBE     .EQ $C010
      1290 *-----
F941- 1300 PRNTAX     .EQ $F941
F94A- 1310 PRBL2      .EQ $F94A
FD0C- 1320 RDKEY      .EQ $FD0C
FD8E- 1330 CROUT      .EQ $FD8E
FDDA- 1340 PRBYTE     .EQ $FDDA
FD4D- 1350 COUT       .EQ $FD4D
      1360 *-----
      1370 *-- BRUN OR "-" COMES HERE -----
      1380 SET.UP.USR.VECTOR
7400- A9 0B 1390        LDA #USR.PROCESSOR  SET UP USR VECTOR
7402- 8D 07 80 1400        STA USR.VECTOR+1
7405- A9 74 1410        LDA /USR.PROCESSOR
7407- 8D 08 80 1420        STA USR.VECTOR+2
740A- 60 1430        RTS
      1440 *-----

```

```

1450 ***-- "USR or USR2 comes here ----
1460 USR.PROCESSOR
1470 LDY #0
1480 STY HORIZ          0 HORIZ POSITION
1490 .1 INY            CHECK INPUT BUFFER FOR OPTION
1500 LDA IN,Y
1510 BEQ SYM1            = $00 is CR (NO OPTION); USE ALPH.
1520 CMP #'2'
1530 BNE .1              OPTION 2 IS SYM2
1540 JMP SYM2
1550 *-----
1560 ***--SYM1 - ALPH. ORDER -----
1570
741C- A9 00 1580 SYM1 LDA #0          SET INDEX TO LETTER A
741E- 85 02 1590 STA ALPH.INDEX
7420- A6 02 1600 .1 LDX ALPH.INDEX      GET ADDR OF 1ST ITEM
7422- BD 32 01 1610 LDA ALPHTABLE,X      OF THIS STARTING LETTER
7425- 85 00 1620 STA PTR              FROM S-C ASM TABLE
7427- E8 1630 INX
7428- BD 32 01 1640 LDA ALPHTABLE,X      HIGH BYTE
742B- 08 1650 PHP
742C- 85 01 1660 STA PTR+1
742E- E8 1670 INX
742F- 86 02 1680 STX ALPH.INDEX      READY FOR NEXT
7431- 28 1690 PLP
7432- F0 08 1700 BEQ .3              SKIP IF NO ITEMS THIS LETTER
7434- 20 60 74 1710 .2 JSR DO.ITEM          PRINT NAME & ADDRESS
7437- 20 E3 74 1720 JSR NEXT.ITEM.A
743A- D0 F8 1730 BNE .2              FOR EACH ITEM, THIS LETTER
743C- A6 02 1740 .3 LDX ALPH.INDEX
743E- E0 32 1750 CPX #50
7440- 90 DE 1760 BCC .1              LOOP 'TILL DONE Z
7442- 4C 8E FD 1770 JMP CROUT          PRINT LAST LINE IN PRINTER
1780 *-----
1790 ***-- SYM2 - NUMERICAL ORDER -----
1800
7445- A5 68 1810 SYM2 LDA LOMEM+1      POINT TO START OF TABLE
7447- 85 01 1820 STA PTR+1
7449- A5 67 1830 LDA LOMEM
744B- 85 00 1840 STA PTR
744D- 20 60 74 1850 .1 JSR DO.ITEM          PRINT NAME & ADDRESS
7450- 20 F1 74 1860 JSR NEXT.ITEM.N
7453- A5 00 1870 LDA PTR              CHECK FOR END
7455- C5 CC 1880 CMP END.TABLE
7457- A5 01 1890 LDA PTR+1
7459- E5 CD 1900 SBC END.TABLE+1
745B- 90 F0 1910 BCC .1              LOOP TILL END OF TABLE
745D- 4C 8E FD 1920 JMP CROUT
1930 *-----
1940 ***-- DO.ITEM -----
1950
7460- A0 06 1960 DO.ITEM LDY #6          GET KEY
7462- B1 00 1970 LDA (PTR),Y
1980 *----- PRINT NAME -----
7464- 29 3F 1990 AND #$00111111    LOW 6-BITS IS LENGTH
7466- 85 06 2000 STA LENGTH
7468- C8 2010 INY
7469- B1 00 2020 .0 LDA (PTR),Y      GET CHAR FROM NAME
746B- 09 80 2030 ORA #$80          HI BIT ON
746D- 20 D9 74 2040 JSR PRCHAR        PRINT IT
7470- C6 06 2050 DEC LENGTH
7472- D0 F4 2060 BNE .0              LOOP TO END OF NAME
7474- A9 AD 2070 LDA #"- "
7476- 20 D9 74 2080 JSR PRCHAR
2090 *----- PRINT ADDRESS -----
7479- A9 00 2100 LDA #0          NOTE: 32 BITS
747B- 85 03 2110 STA NONZERO      USE THIS TO OMIT LEADING 0'S
747D- A0 05 2120 LDY #5
747F- 84 07 2130 STY YSAVE
7481- B1 00 2140 .1 LDA (PTR),Y      GET BYTE OF ADDRESS, HIGH FIRST
7483- D0 04 2150 BNE .2
7485- A5 03 2160 LDA NONZERO      SKIP LEADING 0
7487- F0 09 2170 BEQ .3
7489- 20 DA FD 2180 .2 JSR PRBYTE        PRINT BYTE
748C- E6 04 2190 INC HORIZ
748E- E6 04 2200 INC HORIZ
7490- E6 03 2210 INC NONZERO
7492- C6 07 2220 .3 DEC YSAVE          NEXT BYTE LOWER
7494- A4 07 2230 LDY YSAVE

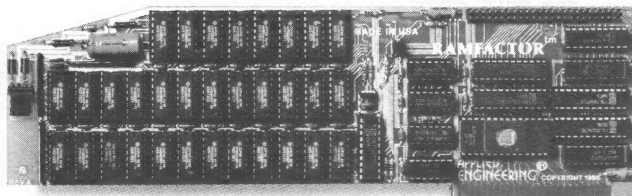
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```

7496- C0 03 2240 CPY #3
7498- B0 E7 2250 BCS .1
749A- B1 00 2260 LDA (PTR),Y ALWAYS DO LOWEST BYTE
749C- 20 DA FD 2270 JSR PRBYTE
749F- E6 04 2280 INC HORIZ
74A1- E6 04 2290 INC HORIZ
#----- TAB -----
74A3- A2 03 2300 LDX #NO.COLUMNS-1
74A5- 18 2320 CLC
74A6- A9 00 2330 LDA #0
74A8- 69 13 2340 .4 ADC #LINE.LENGTH/NO.COLUMNS
74AA- C5 04 2350 CMP HORIZ
74AC- F0 02 2360 BEQ .45
74AE- B0 0C 2370 BCS .5 FOUND
74B0- CA 2380 .45 DEX
74B1- D0 F5 2390 BNE .4 TRY NEXT TAB
74B3- 20 8E FD 2400 JSR CROUT MOVE ON TO NEXT LINE
74B6- A9 00 2410 LDA #0
74B8- 85 04 2420 STA HORIZ
74BA- F0 0B 2430 BEQ .6 ...ALWAYS
74BC- 48 2440 .5 PHA SPACE TO NEXT TAB
74BD- 38 2450 SEC
74BE- E5 04 2460 SBC HORIZ
74C0- AA 2470 TAX
74C1- 20 4A F9 2480 JSR PRBL2
74C4- 68 2490 PLA
74C5- 85 04 2500 STA HORIZ
#----- STOP/START/QUIT -----
74C7- AD 00 C0 2510 .6 LDA KEYBD STOP UPON KEYPRESS
74CA- 10 0C 2530 BPL .7
74CC- 8D 10 C0 2540 STA STROBE
74CF- 20 0C FD 2550 JSR RDKEY WAIT FOR 2ND KEYPRESS
74D2- C9 8D 2560 CMP #8D
74D4- D0 02 2570 BNE .7
74D6- 68 2580 PLA EXIT ON RETURN
74D7- 68 2590 PLA
74D8- 60 2600 .7 RTS
#----- PRCHAR -----
74D9- 84 07 2610 PRCHAR STY YSAVE
74DB- 20 ED FD 2630 JSR COUT
74DE- E6 04 2640 INC HORIZ
74E0- A4 07 2650 LDY YSAVE
74E2- 60 2660 RTS
#----- NEXT.ITEM.A -----
74E3- A0 01 2670 NEXT.ITEM.A LDY #1 GET ADDR OF NEXT ITEM FROM THIS ONE
74E5- B1 00 2700 LDA (PTR),Y (LEFT BY S-C ASM)
74E7- 48 2710 PHA
74E8- 88 2720 DEY
74E9- B1 00 2730 LDA (PTR),Y AND LOW
74EB- 85 00 2740 STA PTR
74ED- 68 2750 PLA
74EE- 85 01 2760 STA PTR+1
74F0- 60 2770 RTS
#----- NEXT.ITEM.N -----
74F1- A0 06 2780 NEXT.ITEM.N LDY #6 GET KEY FROM THIS ITEM
74F3- B1 00 2800 LDA (PTR),Y
74F5- 08 2820 PHP SAVE +/- STATUS
74F6- 29 3F 2830 AND #00111111 GET LENGTH OF SYMBOL
74F8- 18 2840 CLC
74F9- 69 06 2850 ADC #6
74FB- A8 2860 TAY
74FC- 28 2870 PLP
74FD- 10 08 2880 BPL .2 SKIP IF NO LOCAL LABELS
74FF- C8 2890 .1 INY
7500- B1 00 2900 LDA (PTR),Y
7502- F0 03 2910 BEQ .2
7504- C8 2920 INY
7505- D0 F8 2930 BNE .1 ...ALWAYS
#-----
7507- 98 2940 .2 TYA
7508- 38 2960 SEC
7509- 65 00 2970 ADC PTR
750B- 85 00 2980 STA PTR
750D- 90 02 2990 BCC .4
750F- E6 01 3000 INC PTR+1
7511- 60 3010 .4 RTS

```

Minuteman 250 UPS

For years I have been wanting an uninterruptible power supply. Now with a Sider and a large RAMWORKS card, it is almost an imperative. A short interruption of power could easily destroy a full day's work or more. If it occurred while I am writing on the Sider or even on a floppy, it could result in a lot more damage. Other power problems, like spikes which occur during thunderstorms, can cause physical damage to the power supplies in the Apple or its peripherals. I might be able to blame the recent \$177 replacement of my Sider power supply on just such a storm.

The reason I haven't bought a UPS before now is the price. Almost all of them are over \$500. At last I have found one with most of the features I want, for only \$359.

The Minuteman 250, from Para Systems (a local Dallas company), is just right for an Apple II system. It may be right for yours as well. If so, we will send you one for \$350 plus freight. Normal freight inside the USA should be under \$10. Para Systems makes a full line of UPS products, up to 1000 watts. The Minuteman 250 is rated at 250 watts, and is more than adequate for an Apple II system.

The unit is about an inch larger than a standard Disk II drive in each dimension (it fits nicely under the drive on my system), and weighs 19 pounds. It is heavy for its size, because there is a lot inside: sealed maintenance-free 12-volt battery, inverter and charger electronics, line surge protection, and so on. Normally, power from the AC-line passes through a 3-stage EMI/RFI filter and surge protector directly to your equipment. When the AC-power drops below 95 volts, a battery-powered inverter takes over within four milliseconds. The inverter output is a stepped rectangular wave form, which approximates a sine wave. (Pure sine-wave output costs a lot more, and is not necessary for any equipment I am using.)

There are two outlets, so I plugged my Sider into one and my Apple //e into the other. Usually I have a fan on the side of my //e, from RH Electronics or Kensington Microware. The fan unit plugs into the Minuteman UPS, and powers the Apple //e, an Apple monochrome monitor, and a dot matrix printer. The printer is rated about 60 watts, Sider about 40 watts, monitor about 30 watts, and Apple about 60 watts. That is a total of 190 watts, if the printer is running, or 130 when it is not running. Minuteman can handle a 250-watt load, and maintain full operation for five minutes after the AC input power goes away. If I am not printing, it should maintain full operation of everything else for 15 minutes. That is plenty of time to back up whatever I am working on and turn off the system.

There are a few disadvantages. When AC input power goes away, there is an audible alarm. The alarm is a continuous tone, sounding for the entire time that the AC is off and the battery is powering the system. When the battery has two minutes of charge remaining, the alarm changes to a beep-beep-beep sound. There is no way to shut off the alarm until either AC power

comes back on, or you turn off your computer and the UPS. It gets very tiresome. I think there should be a way to either turn off the audible alarm, until the last two minutes of battery power, or at least change it to a short blip once per half-minute or so.

However, in the nine years I have been using Apples, I have not had a serious power outage while my computer was in use. Maybe as many as ten times in nine years there have been very short power outages, most as short as one or two seconds. There have been occasional annoying problems we have blamed on power glitches, spikes, or whatever. The Minuteman should take care of all of these.

The other disadvantage is that when you are leaving the system off and unattended for a long time, you are supposed to remember to turn off the Minuteman. If you leave it on, and AC power goes off for a long time, the battery could be damaged. I don't know how long power would have to be off to damage the battery, since the only power used would be that to run the inverter, but I am guessing it would be at least several hours. It seems to me that there should be a circuit built in to the Minuteman to detect the no-external-load condition, and shut itself off before battery damage could occur.

Even with these disadvantages, I heartily recommend the Minuteman 250. If it even saves me from ONE catastrophic situation, it could pay for itself. As I mentioned above, we will send you one for only \$350 plus freight.

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- 8 channels D/A
- Superfast conversion time
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- Manual contains sample applications

A/D SPECIFICATIONS

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 - On-board memory
 - Fast conversion (0.78 MS per channel)
 - A/D process totally transparent to Apple (looks like memory)
 - User programmable input ranges are 0 to 10 volts, 0 to 5, -5 to +5, -2.5 to +2.5, -5 to 0, -10 to 0.
- The A/D process takes place on a continuous, channel sequencing basis. Data is automatically transferred to its proper location in the on-board RAM. No A/D converter could be easier to use.

D/A SPECIFICATIONS

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 - On-board memory
 - On-board output buffer amps can drive 5 MA
 - D/A process is totally transparent to the Apple (just poke the data)
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 - User programmable output ranges are 0 to 5 volts and 0 to 10 volts
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FEATURES

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- 22 pin, 156 spacing edge card input connector (extra connectors are easily available i.e. Radio Shack).
- Large bread board area.
- Full detailed schematic included.

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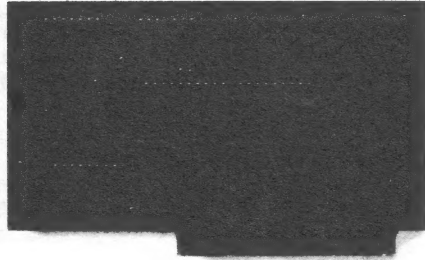
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Several readers have asked how to automatically execute some file upon starting the ProDOS S-C Macro Assembler, perhaps the Full Screen Editor, perhaps a RAMdisk program, or maybe an EXEC file to install several features. What people want is something analogous to BASIC.SYSTEM's automatic "-STARTUP" feature.

We should be able to patch the assembler's installation code to issue a ProDOS command by stuffing the command into the input buffer, terminated with a Carriage Return, and then calling \$BE03 to execute the command. However, not all commands function properly under this approach. The problem here is that the "-" command doesn't work, and the BRUN command seems to depend on how the called program exits. Specifically, when I tried to install my RAMdisk by sending BRUN PRODRIVE the program ran OK, but then crashed into the monitor rather than starting the assembler. A "-" command seemed to be simply ignored. I did find that BRUN FSE to install the Full Screen Editor worked correctly.

The ProDOS books say that you cannot issue the "-" and EXEC commands this way under BASIC.SYSTEM, so I assumed that EXEC would also fail for the assembler. The first version of this article therefore talked only about installing FSE, and suggested carefully testing other programs. At the last minute I decided to actually test EXEC before printing this. IT WORKED!

So, all you have to do is add the following patch to the assembler's installation code and create a text file to issue the commands you want. Here's the SETUP file I use:

```
- PRODRIVE
BLOAD SCASM.SYSTEM,A$2000,TSYS
BSAVE /RAM/SCASM.SYSTEM,A$2000,TSYS,L17920
BLOAD BASIC.SYSTEM,A$2000,TSYS
BSAVE /RAM/BASIC.SYSTEM,A$2000,TSYS,L10240
BLOAD FILER
BSAVE /RAM/FILER,A$1000,L25600
```

If you want to try this technique with other programs, be sure to start out with a test disk in case of unpredictable results.

You can confirm the address of the SC.INIT routine by checking the JSR instruction at \$8000 when the assembler is running. In the assembler's installation routine, \$206A is the address of the JMP \$8000 instruction that actually starts the assembler.

To install this into the assembler, first boot into the ProDOS S-C Macro Assembler, then do these steps:

```
:LOAD S.STARTER
:BLOAD SCASM.SYSTEM,A$2000,TSYS
:ASM
:BSAVE SCASM.SYSTEM,A$2000,L17920
```

If the file length of the assembler is different in the catalog of your disk, use that length in the L parameter.

```

1000 *SAVE S.STARTER
1010 *-----
0200- 1020 WBUF .EQ $200
1030
830F- 1040 SC.INIT .EQ $830F
BE03- 1050 DOSCMD .EQ $BE03
1060 *-----
1070 .OR $206A
206A- 4C B0 21 1080 JMP STARTER
1090
1100 .OR $21B0
1110 STARTER
21B0- 20 0F 83 1120 JSR SC.INIT get assembler ready
21B3- A2 00 1130 LDX #0
21B5- BD C6 21 1140 .1 LDA COMMAND,X
21B8- F0 06 1150 BEQ .2
21BA- 9D 00 02 1160 STA WBUF,X stuff command into buffer
21BD- E8 1170 INX
21BE- D0 F5 1180 BNE .1 always
1190
21C0- 20 03 BE 1200 .2 JSR DOSCMD do it!
21C3- 4C 03 80 1210 JMP $8003 just in case
1220 *-----
21C6- C5 D8 C5
21C9- C3 A0 D3
21CC- C5 D4 D5
21CF- D0
21D0- 8D 00 1230 COMMAND .AS -/EXEC SETUP/
1240 .HS 8D00

```

More on DOS 3.3 and BRUN.....Louis Pitz

In the June 1986 issue of AAL Bob tried to give the final word on the problem of using BRUN to execute machine language programs which themselves issue DOS commands. His last example, on page 12, still falls short of a complete solution. By adding some code I found in "Beneath Apple DOS", page 6-17, the solution can be complete. The following code can be BRUN either from the keyboard or from within an Applesoft program:

```

1000 .OR $300
1010 .TF B.SHOW.OFF
1020 *-----
1030 PITZ.VERSION
0300- AD 59 AA 1040 LDA $AA59 SAVE DOS STACK POINTER
0303- 48 1050 PHA ON THE STACK
1060 *-----
0304- A0 00 1070 LDY #0
0306- B9 29 03 1080 .1 LDA MSG,Y ISSUE DOS CATALOG COMMAND
0309- 20 ED FD 1090 JSR $FDED
030C- C8 1100 INY
030D- C0 0A 1110 CPY #MSGSZ
030F- D0 F5 1120 BNE .1
1130 *-----
0311- A9 00 1140 LDA #0 EQUIVALENT TO "NOMON C"
0313- 8D 5E AA 1150 STA $AA5E
0316- 68 1160 PLA
0317- 8D 59 AA 1170 STA $AA59
1180 *-----
031A- A4 76 1190 LDY $76 MSB OF APPLESOFT LINE NUMBER
031C- C8 1200 INY IF WAS $FF, MAKE $00
031D- F0 07 1210 BEQ .2 ...NOT IN APPLESOFT RUN MODE
031F- A4 33 1220 LDY $33 PROMPT CHARACTER
0321- C0 DD 1230 CPY #"]" IS IT THE APPLESOFT PROMPT?
0323- F0 01 1240 BEQ .2 ...YES, SO NOT IN RUN MODE
0325- 60 1250 RTS PROGRAM RUNNING, EXIT WITH "RTS"
0326- 4C D0 03 1260 .2 JMP $3D0 NOT RUNNING, EXIT THE OTHER WAY
1270 *-----
0329- 8D 84 1280 MSG .HS 8D.84 <RETURN>, CTRL-D
032B- C3 C1 D4
032E- C1 CC CF
0331- C7 1290 .AS -/CATALOG/
0332- 8D 1300 .HS 8D
0A- 1310 MSGSZ .EQ *-MSG
1320 *-----

```

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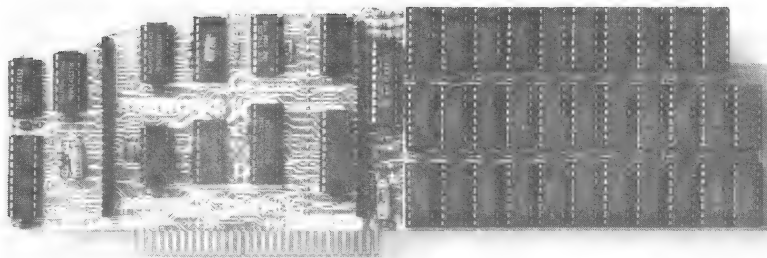
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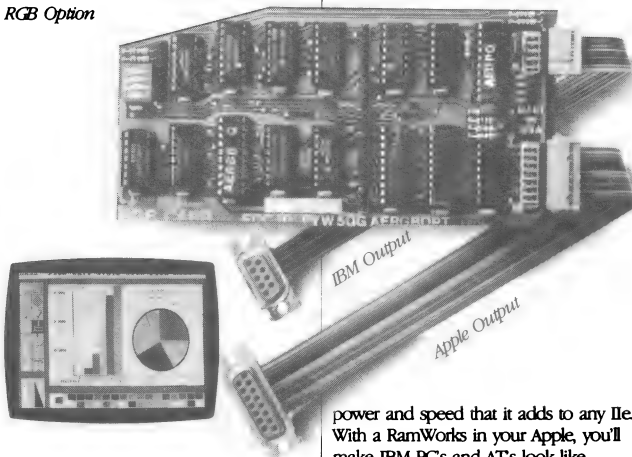
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RGB Option



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An Important Patch for ProDOS S-C Macro Assembler

For over a year now a design error has been lurking inside the ProDOS version of the S-C Macro Assembler. Both the assembler and ProDOS itself make extensive use of the standard system input buffer, \$200-2FF. During assembly, if you try to direct the object code to more than one target file (using the .TF directive more than one time), things did not go well. The DOS 3.3 version had no such problem.

Following is an example of such a source file. If you type it in and try to assemble it with the ProDOS version, the second, and third ".OR" lines will not list properly. In fact, if you have a ProDOS-compatible clock installed, you will see the date and time information instead!

```
1000 *SAVE S.TEST.FIXTF
1010 *-----
1020          .OR $300
1030          .TF B1
1040 X        LDA #3
1050 *-----
1060          .OR $310
1070          .TF B2
1080 Y        LDA #3
1090 *-----
1100          .OR $320
1110          .TF B3
1120 Z        LDA #3
1130 *-----
```

After much thought, the only way I can think of to "fix" it is to save the contents of the buffer each time the assembler issues a ProDOS command, and restore the contents afterward. There just happens to be enough room in a "patch" area between \$BC00 and \$BCFF to do this. The code that needs to be patched may not be in exactly the same location in every copy of the ProDOS version we have sold, so I have written a patching program which will automatically find the exact location and install the patches.

In the following program, a "dummy" section at lines 1800-1940 shows the patched routine. The addresses shown correspond to the latest version. The code shown at \$901F-9034 was originally located three bytes lower, at \$901C-9031. My patcher moves the code three bytes higher, as shown, and inserts the JSR PATCH1 and JMP PATCH2 code. The PATCH code goes into a free space at \$BC00, and the save area is from \$BC80 through \$BCFF. The patches are actually installed on the image of the SCASM.SYSTEM file, as BLOADED into \$2000-\$65FF.

Once you have the patching program typed in, the procedure to install the patches is as shown in the comments at the beginning of the program (lines 1020-1060). Just to be sure you have it all right, don't save the patched version on an important disk! Try it out first on a scratch disk, and if everything still works you can update your master copies.

On the other hand, if the whole process seems to laborious or dangerous, send us the original disk of the ProDOS S-C Macro Assembler and we will update it for you. Or, if we have your

registration on file you may send \$5 and we will send you a fresh disk with the updated version on it.

Many thanks to Richard A. Sims for pointing out this problem to us.

```

1000 *SAVE FIX.TF.9.8.86
1010 *-----
1020 *      :LOAD FIX.TF.9.8.86
1030 *      :ASM
1040 *      :BLOAD SCASM.SYSTEM,TSYS,A$2000
1050 *      :$800G
1060 *      :BSAVE SCASM.SYSTEM,TSYS,A$2000,L$4600
1070 *-----
00- 1080 PNTR .EQ $00,01
1090 *-----
1100 PATCH.SZ
1110 *---COPY PATCH1, PATCH2 TO $5D00 (IMAGE OF $BC00)---
0800- A0 00 1120 LDY #0
0802- B9 6D 08 1130 LDA BC00,Y
0805- 99 00 5D 1140 STA $5D00,Y
0808- C8 1150 INY
0809- C0 1E 1160 CPY #BC00.SZ
080B- 90 F5 1170 BCC .1
1180 *---FIND A2.FF.E8.BD.CE BTWN 2000.65FF-----
080D- A9 00 1190 LDA #$2000
080F- 85 00 1200 STA PNTR
0811- A9 20 1210 LDA /$2000
0813- 85 01 1220 STA PNTR+1
0815- A0 00 1230 .2 LDY #0
0817- B1 00 1240 .3 LDA (PNTR),Y
0819- D9 68 08 1250 CMP STRING,Y
081C- F0 0D 1260 BEQ .4 ...MATCHES SO FAR
081E- E6 00 1270 INC PNTR
0820- D0 F3 1280 BNE .2
0822- E6 01 1290 INC PNTR+1
0824- A5 01 1300 LDA PNTR+1
0826- C9 66 1310 CMP /$6600
0828- 90 EB 1320 BCC .2
082A- 00 1330 BRK COULD NOT FIND STRING
1340 ***
082B- C8 1350 .4 INY
082C- C0 05 1360 CPY #STRING.SZ
082E- 90 E7 1370 BCC .3
1380 *---COPY ADDRESS OF PASS.CMD.TO.PRODOS-----
0830- A0 1A 1390 LDY #$1A
0832- B1 00 1400 LDA (PNTR),Y
0834- 8D 10 5D 1410 STA PATCH2-$BC00+$5D00+4
0837- C8 1420 INY
0838- B1 00 1430 LDA (PNTR),Y
083A- 8D 11 5D 1440 STA PATCH2-$BC00+$5D00+5
1450 *---SHIFT "ISSUE.DOS.COMMAND" 3 BYTES AHEAD-----
083D- A0 15 1460 LDY #$15
083F- B1 00 1470 .5 LDA (PNTR),Y
0841- C8 1480 INY
0842- C8 1490 INY
0843- C8 1500 INY
0844- 91 00 1510 STA (PNTR),Y
0846- 88 1520 DEY
0847- 88 1530 DEY
0848- 88 1540 DEY
0849- 88 1550 DEY
084A- 10 F3 1560 BPL .5
1570 *---BUILD "JSR PATCH1"-----
084C- A0 00 1580 LDY #0
084E- A9 20 1590 LDA #$20
0850- 91 00 1600 STA (PNTR),Y
0852- C8 1610 INY
0853- A9 00 1620 LDA #PATCH1
0855- 91 00 1630 STA (PNTR),Y
0857- C8 1640 INY
0858- A9 BC 1650 LDA /PATCH1
085A- 91 00 1660 STA (PNTR),Y
1670 *---BUILD "JMP PATCH2"-----
085C- A0 1A 1680 LDY #$1A
085E- A9 0C 1690 LDA #PATCH2
0860- 91 00 1700 STA (PNTR),Y
0862- C8 1710 INY

```



NEW !!!][IN A MAC: \$69.00

This Apple II emulator runs DOS 3.3 and PRODOS programs (including 6502 machine language routines) on a 512K Macintosh. All Apple II features are supported such as HI-RES/LO-RES graphics, 40/80 column text screens, language card and joystick. Also included: clock, RAM disk, keyboard buffer, on-screen HELP, access to the desk accessories and support for 4 logical disk drives. Package includes 2 MAC diskettes (PROGRAM holds emulation, communications and utility software, DATA holds DOS 3.3 and PRODOS system masters, including Applesoft and Integer BASIC) and 1 Apple II diskette (transfer software moves disk images to the MAC).

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Develop HI-RES screens for your Apple II on a Macintosh. Don't be limited by MousePaint or other screen editors. Use MACPAINT (or any other application) on the MAC to create your Apple II screen. Then use SCREEN.GEN to transfer directly from the MAC to the Apple II (with SuperSerial card or equivalent). Package includes Apple II diskette with transfer software plus fully commented SOURCE code.

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Compatible with any MIDI equipped music keyboard, synthesizer, organ or piano. Package includes a MIDI-out cable (plugs directly into modem port - no modifications required!) and 6-song demo diskette. Large selection of digitized QRS player-piano music available for 19.00 per diskette (write for catalog). MIDI-MAGIC compatible with Apple II family using Passport MIDI card (or our own input/output card w/drum sync for only \$99.00).

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* The Font Downloader & Editor for the Apple Imagewriter Printer. For use with Apple II, II+, //e (with SuperSerial card) and the Apple][c (with builtin serial interface).

* FONT LIBRARY DISKETTE #1: \$19.00 contains lots of user-contributed fonts for all printers supported by the Font Downloader & Editor. Specify printer with order.

DISASM 2.2e : \$30.00 (\$50.00 with SOURCE Code)

Use this intelligent disassembler to investigate the inner workings of Apple II machine language programs. DISASM converts machine code into meaningful, symbolic source compatible with S-C, LISA, ToolKit and other assemblers. Handles data tables, displaced object code & even provides label substitution. Address-based triple cross reference generator included. DISASM is an invaluable machine language learning aid to both novice & expert alike. Don Lancaster says DISASM is "absolutely essential" in his ASSEMBLY COOKBOOK.

The 'PERFORMER' CARD: \$39.00 (\$59.00 with SOURCE Code)

Converts a 'dumb' parallel printer I/F card into a 'smart' one. Command menu eliminates need to remember complicated ESC codes. Features include perforation skip, auto page numbering with date & title. Includes large HIRRES graphics & text screen dumps. Specify printer: MX-80 with Grafbtrax-80, MX-100, MX-80/100 with Grafbtraxplus, NEC 8092A, C.Itoh 8510 (Prowriter), OkiData 82A/83A with Okigraph & OkiData 92/93.

'MIRROR' ROM: \$25.00 (\$45.00 with SOURCE Code)

Communications ROM plugs directly into Novation's Apple-Cat Modem card. Basic modes: Dumb Terminal, Remote Console & Programmable Modem. Features include: selectable pulse or tone dialing, true dialtone detection, audible ring detect, ring-back, printer buffer, 80 col card & shift key mod support.

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Plugs into any Apple slot. Holds one user-supplied 2Kx8 memory chip (6116 type RAM for program development or 2716 EPROM to keep your favorite routines on-line). Maps into \$Cn00-CnFF and \$C800-CFFF.

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```

0863- A9 BC      1720      LDA /PATCH2
0865- 91 00      1730      STA (PNTR),Y
0867- 60         1740      RTS
0868- A2 FF E8    1750      *-----
086B- BD CE      1760      STRING .HS A2.FF.E8.BD.CE
05-      1770      STRING.SZ .EQ *-STRING
05-      1780      *-----
05-      1790      .DUMMY
05-      1800      .OR $901C
05-      1810      ISSUE.DOS.COMMAND
901C- 20 00 BC    1820      JSR PATCH1
901F- A2 FF      1830      LDX #-1
9021- E8         1840      .1
9022- BD CE 02    1850      LDA $2CE,X
9025- 9D 05 02    1860      STA $205,X
9028- D0 F7      1870      BNE .1
902A- AA         1880      TAX
902B- E8         1890      .2
902C- C8         1900      INX
902D- B9 4B 90    1910      LDA $904B,Y
9030- 9D FF 01    1920      STA $1FF,X
9033- 10 F6      1930      BPL .2
9035- 4C 0C BC    1940      JMP PATCH2
05-      1950      .ED
05-      1960      *-----
BC00- A2 00      1970      BC00 .PH $BC00
BC02- BD 00 02    1980      PATCH1 LDX #0
BC05- 9D 80 BC    1990      .1
BC08- E8         2000      STA $BC80,X
BC09- 10 F7      2010      INX
BC0B- 60         2020      BPL .1
BC0C- 8E 42 BE    2030      RTS
BC0F- 20 00 00    2040      PATCH2 STX $BE42 ALLOW DEFERRED COMMANDS
BC12- A2 7F      2050      JSR #-# $84C2
BC14- BD 80 BC    2060      .3
BC17- 9D 00 02    2070      LDX #127
BC1A- CA         2080      LDA $BC80,X
BC1B- 10 F7      2090      STA $200,X
BC1D- 60         2100      DEX
05-      2110      BPL .3
05-      2120      RTS
05-      2130      .EP
05-      2140      BC00.SZ .EQ *-BC00
05-      2150      *-----

```

Patch Bob's ProDOS Selector for Videx.....Garth O'Donnell

The new ProDOS program selector code published in the July 1986 AAL works very well in most configurations, but not in a slot 3 80-column card such as the Videx card I have. The following modifications allow it to work on an Apple II Plus with a Videx 80-column card:

	Original	Videx Version
1425	LDA #\$99	LDA #\$8C
1640	JSR HOME	LDA #\$8C
1641	-----	JSR COUT
3460	LDA #\$FF	LDA #\$8E
3470	STA INVFLG	JSR COUT
4500	LDA #\$3F	LDA #\$8F
4510	STA INVFLG	JSR COUT

These same changes may work with most other 80-column cards, including the //c and //e. The only place I am sure they do not work is in 40-columns. Perhaps by squeezing the code somewhere, we could find room to test the byte at \$37. If (\$37) is \$C3, then we are most probably in an 80-column mode, and should use the patched version above; if not \$C3, then do it the way Bob originally wrote it.

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832k MULTIRAM	266.	239.
1024k MULTIRAM	284. ←	← ← ← ←
1344k MULTIRAM	449.	.
1600k MULTIRAM	484.	.
1792k MULTIRAM	519.	.
65C816 EX Co-Processor Card		
Apple Ile Enhancement Kit		157.
Cermetek 1200 baud internal modem Ile/Ii+		62.
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		20.

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The "L" command in Wozniak's monitor is one of the great secrets behind Apple's success. "L" has been the key to unlocking many secret doors, enabling programmers to stand on each other's shoulders in their efforts to write all the wonderful software we now enjoy.

Nevertheless, "L" can be improved. We have published at least once before a way to add the ability to specify starting and ending addresses, rather than just living with the built in 20-lines-at-a-time feature. Now that ProDOS is so prevalent, it would be nice if the "L" command could properly handle MLI calls. The three bytes which follow any "JSR \$BF00" instruction should be dis-assembled as one hex byte and an address.

The following program adds both of these improvements. It sets up the control-Y monitor command, so that you can disassemble a range of memory. The command can be entered in several formats. In the following examples, "^Y" means "control-Y"

```
*2000^Y      disassemble one instruction
*2000.20FF^Y  disassemble 2000..20FF
*.2300^Y      continue and go thru 2300
```

In the listing which follows, lines 1140-1210 install the control-Y vector, so that that monitor command will call DISASM.BF00.

Lines 1240-1300 move the starting address into PC for the disassembler code, and increment the ending address so it will be easier to check later.

Lines 1320-1400 and 1780-1840 handle normal disassembly, but allow for the option of pausing by pressing any key, or aborting by pressing <RETURN>. If the line disassembled was "JSR \$BF00", then lines 1420-1760 disassemble the MLI call number and the address of the MLI parameter block. For example, a disassembled call may look like this:

```
2000- 20 00 BF  JSR $BF00
2003- C1 34 20  .DA #$C1,$2034
```

Some of you enterprising people who have the source code to the Rak-Ware DISASM may want to add a feature like this to that product, too.

```

1000 *SAVE S.DISASM.BF00
1010 *-----
3A- 1020 PC      .EQ $3A,3B
3C- 1030 A1      .EQ $3C,3D
3E- 1040 A2      .EQ $3E,3F
40- 1050 PARMs    .EQ $40,41,42
    1060 *-----
F8D0- 1070 MON.INSTDP .EQ $F8D0
F948- 1080 MON.PRBLNK .EQ $F948
F953- 1090 MON.PCADJ  .EQ $F953
FD96- 1100 MON.PRYX2  .EQ $FD96
FD96- 1110 MON.PRBYTE .EQ $FD96
FD96- 1120 MON.COUT   .EQ $FD96
FDED- 1130 *-----
```

```

1140 INSTALL.CTRL.Y.VECTOR
0800- A9 4C 1150 LDA #34C JMP OPCODE
0802- 8D F8 03 1160 STA $3F8
0805- A9 10 1170 LDA #DISASM.BF00
0807- 8D F9 03 1180 STA $3F9
080A- A9 08 1190 LDA /DISASM.BF00
080C- 8D FA 03 1200 STA $3FA
080F- 60 1210 RTS
-----*-----
1220
1230 DISASM.BF00
0810- A5 3C 1240 LDA A1 LOAD STARTING ADDRESS
0812- 85 3A 1250 STA PC
0814- A5 3D 1260 LDA A1+1
0816- 85 3B 1270 STA PC+1
0818- E6 3E 1280 INC A2 ADJUST END ADDRESS
081A- D0 02 1290 BNE .1
081C- E6 3F 1300 INC A2+1
-----*-----
1310
1320 .1 JSR PAUSE
0821- 20 94 08 1330 JSR CHECK.FOR.MLI.CALL
0824- 08 1340 PHP SAVE ANSWER
0825- 20 D0 F8 1350 JSR MON.INSTDP
0828- 20 53 F9 1360 JSR MON.PCADJ
082B- 85 3A 1370 STA PC
082D- 84 3B 1380 STY PC+1
082F- 28 1390 PLP
0830- D0 55 1400 BNE .2 WAS IT "JSR $BF00"?
-----*-----
1410 ... NO
1420
1430 TAX DO PARMS LINE
0833- 20 96 FD 1430 JSR MON.PRYX2 ADDR-
0836- 20 48 F9 1440 JSR MON.PRBLNK
0839- A0 00 1450 LDY #0
083B- 20 A7 08 1460 JSR MY.PRBYTE XX XX XX
083E- 20 A7 08 1470 JSR MY.PRBYTE
0841- 20 A7 08 1480 JSR MY.PRBYTE
0844- 20 48 F9 1490 JSR MON.PRBLNK
0847- A9 AE 1500 LDA #". " ".DA"
0849- 20 ED FD 1510 JSR MON.COUT
084C- A9 C4 1520 LDA #"D"
084E- 20 ED FD 1530 JSR MON.COUT
0851- A9 C1 1540 LDA #"A"
0853- 20 ED FD 1550 JSR MON.COUT
0856- 20 48 F9 1560 JSR MON.PRBLNK
0859- A9 A3 1570 LDA #"#"
085B- 20 ED FD 1580 JSR MON.COUT
085E- A9 A4 1590 LDA #" $"
0860- 20 ED FD 1600 JSR MON.COUT
0863- A5 40 1610 LDA PARMS
0865- 20 DA FD 1620 JSR MON.PRBYTE
0868- A9 AC 1630 LDA #" "
086A- 20 ED FD 1640 JSR MON.COUT
086D- A9 A4 1650 LDA #" $"
086F- 20 ED FD 1660 JSR MON.COUT
0872- A5 42 1670 LDA PARMS+2
0874- 20 DA FD 1680 JSR MON.PRBYTE
0877- A5 41 1690 LDA PARMS+1
0879- 20 DA FD 1700 JSR MON.PRBYTE
087C- 18 1710 CLC
087D- A5 3A 1720 LDA PC
087F- 69 03 1730 ADC #3
0881- 85 3A 1740 STA PC
0883- 90 02 1750 BCC .2
0885- E6 3B 1760 INC PC+1
-----*-----
1770
1780 .2 STA A1 (SET UP FOR ".ENDADDR~Y" CALL)
0887- 85 3C 1790 CMP A2 CHECK IF FINISHED
0889- C5 3E 1800 LDA PC+1
088B- A5 3B 1810 STA A1+1
088D- 85 3D 1820 SBC A2+1
088F- E5 3F 1830 BCC .1
0891- 90 8B 1840 RTS
0893- 60 1850
-----*-----
1860 CHECK.FOR.MLI.CALL
0894- A0 00 1870 LDY #0 LOOK AHEAD FOR "JSR $BF00"
0896- B1 3A 1880 LDA (PC),Y
0898- C9 20 1890 CMP #20 JSR?
089A- D0 0A 1900 BNE .1 ... NO
089C- C8 1910 INY
089D- B1 3A 1920 LDA (PC),Y
089F- D0 05 1930 BNE .1 ... NOT JSR $BF00

```

08A1-	C8	1940	MOV	
08A2-	B1 3A	1950	LDA (PC),Y	
08A4-	C9 BF	1960	CMP #BF	
08A6-	60	1970	RTS	
		1980	-----	
		1990	MY.PRBYTE	
08A7-	B1 3A	2000	LDA (PC),Y	
08A9-	99 40 00	2010	STA PARM\$,Y	
08AC-	20 DA FD	2020	JSR MON.PRBYTE	
08AF-	A9 A0	2030	LDA #" "	
08B1-	20 ED FD	2040	JSR MON.COUT	
08B4-	C8	2050	INY	
08B5-	60	2060	RTS	
		2070	-----	
08B6-	AD 00 C0	2080	PAUSE LDA \$C000	
08B9-	10 15	2090	BPL .3	
08BB-	8D 10 C0	2100	STA \$C010	
08BE-	C9 8D	2110	CMP #8D	
08C0-	F0 0C	2120	BEQ .4	...ABORT
08C2-	AD 00 C0	2130	LDA \$C000	
08C5-	10 FB	2140	BPL .1	
08C7-	8D 10 C0	2150	STA \$C010	
08CA-	C9 8D	2160	CMP #8D	
08CC-	D0 02	2170	BNE .3	
08CE-	68	2180	PLA	
08CF-	68	2190	PLA	
08D0-	60	2200	RTS	
		2210	-----	

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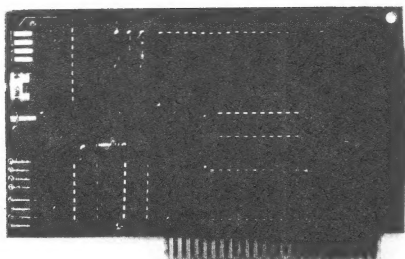
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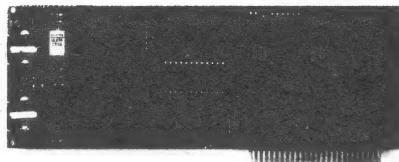
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VIEWMASTER 80	x	x	x	x	x	x	x	x	x	x
SUPRTERM	x	x	x	x	x	x	x	x	x	x
WIZARD 80	x	x	x	x	x	x	x	x	x	x
VISION 80	x	x	x	x	x	x	x	x	x	x
OMNIVISION	x	x	x	x	x	x	x	x	x	x
VIEWMAX 80	x	x	x	x	x	x	x	x	x	x
SMARTERM	x	x	x	x	x	x	x	x	x	x
VIDEOTERM	x	x	x	x	x	x	x	x	x	x

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That Other Integer Square Root.....Bob Sander-Cederlof

As I mentioned last month, just as we were wrapping up the August issue I found a reference to another implementation of the "high school" method of taking square roots. By the time I got it ready there was no room left in that issue, so we postponed it 'til now. Most of the variables are the same as those used in the various routines presented last month.

In the May, 1985 issue of Dr. Dobb's Journal, in the 16-Bit Software Toolbox column, Jim Cathey offered a 68000 16-bit edition of the algorithm. What follows is my 6502 8-bit rendition of his approach.

```

10-      3860 *-----
11-      3870 ERRHI .EQ 16
      3880 ERRLO .EQ 17
      3890 *-----
      3900 *   METHOD DERIVED FROM 68000 CODE IN DDJ MAY 85
      3910 *   6502 VERSION AVERAGES 737 CYCLES
      3920 *-----
0998- A5 01 3930 SQR3   LDA ARGHI   Save working copy of argument
099A- 85 0E 3940       STA WORKHI
099C- A5 00 3950       LDA ARGLO
099E- 85 0F 3960       STA WORKLO
09A0- A9 00 3970       LDA #0
09A2- 85 05 3980       STA ROOT   Start with ROOT = 0
09A4- 85 10 3990       STA ERRHI   and ERR = 0
09A6- 85 11 4000       STA ERRLO
      4010 *-----
09A8- A0 08 4020       LDY #8       8 pairs of bits in argument
09AA- 06 0F 4030 .1     ASL WORKLO   Two bits out of WORK into ERR
09AC- 26 0E 4040       ROL WORKHI
09AE- 26 11 4050       ROL ERRLO
09B0- 26 10 4060       ROL ERRHI
09B2- 06 0F 4070       ASL WORKLO
09B4- 26 0E 4080       ROL WORKHI
09B6- 26 11 4090       ROL ERRLO
09B8- 26 10 4100       ROL ERRHI
09BA- 06 05 4110       ASL ROOT     ROOT = ROOT*2
09BC- A5 05 4120       LDA ROOT     BIT = ROOT*2
09BE- 0A 4130       ASL
09BF- 85 0B 4140       STA BITLO
09C1- A9 00 4150       LDA #0
09C3- 2A 4160       ROL
09C4- 85 0A 4170       STA BITHI
09C6- A5 11 4180       LDA ERRLO    (CARRY IS CLEAR)
09C8- E5 0B 4190       SBC BITLO    COMPUTE: ERR-BIT-1
09CA- AA 4200       TAX             SAVE LO DIFFERENCE
09CB- A5 10 4210       LDA ERRHI
09CD- E5 0A 4220       SBC BITHI
09CF- 90 06 4230       BCC .2       ERR < BIT
09D1- 85 10 4240       STA ERRHI
09D3- 86 11 4250       STX ERRLO
09D5- E6 05 4260       INC ROOT     ROOT = ROOT+1
09D7- 88 4270 .2     DEY
09D8- D0 4280       BNE .1
09DA- 60 4290       RTS
      4300 *-----

```

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Thoughts on the ProDOS Bit Map.....Louis Pitz

I recently learned some more about ProDOS, the hard way. Yes, sometimes catastrophe is indeed the mother of invention, or at least of learning. I was trying to finsih typing and saving a program when an electrical storm started. When I did a CATALOG, all the files seemed to be okay, but the footer info at the end about blocks free, used, and total was goofed up. Where I expected 86, 58, and 144, there was instead 681, 64999, and 144.

As an aside, there were only 144 total blocks because the disk is a combination of ProDOS and DOS 3.3, as described in AAL Sep 85 (page 11). But the lesson I learned would apply on regular ProDOS-only disks as well.

Note the logic in the goofed-up numbers: $681+64999 = 144 \bmod 65536$. I suspected that, since everything else was okay, the volume bit map had been messed up. So I inspected the blocks on disk and confirmed my suspicion.

Further, the garbage in the volume bit map block was clearly extraneous, and none of the the good data (the first $144/8=18$ bytes) had been changed. The garbage was \$DC's in bytes \$14A-1C0, inclusive. This is way past the end of the 'real' bytes even for a ProDOS-only disk (35 bytes). But ProDOS must have counted the 1-bits in the \$DC bytes as free blocks. Then, subtracting this erroneously large number from 144, it got 64999. Yes! $\$DC=\11011100 , and there are $\$77=119$ such bytes, so that is $5*119=595$ more "free" blocks to add to the 86 really free to get 681.

I've read Sandy Mossberg's article about the ProDOS CAT and CATALOG commands (Nibble, May 86), but the arithmetic counting used sectors must be buried deep in the MLI, associated with the GET-FILE-INFO call, according to my Beneath Apple ProDOS book. Apparently ProDOS must count all the 1-bits in the volume bit map blocks as free, regardless of the number of total blocks on the disk. In a way this seems like a bug, but I guess it was just a shortcut in coding.

The lesson I have learned is not to use the "unused" part of the volume bit map to store code, messages, or anything. For a ProDOS-only floppy, only 35 bytes are really used, and 477 bytes are wasted. Nevertheless, do not be tempted to use them. They are set to 0 upon formatting the disk, and ProDOS depends upon them staying that way! I've used the extra bytes in the DOS 3.3 VTOC before, but I had better resist this impulse in ProDOS.

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